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Award Number: DAMD17-99-1-9305

TITLE: Psychological Distress, Cognitive Bias and Breast Cancer Surveillance Behavior in Women Tested for BRCA 1/2 Mutation

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REPORT DATE: August 2001

TYPE OF REPORT: Annual Summary

PREPARED FOR: U.S. Army Medical Research and Materiel Command
Fort Detrick, Maryland 21702-5012

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 074-0188

1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	August 2001	Annual Summary (1 Jul 00 - 1 Jul 01)

4. TITLE AND SUBTITLE
Psychological Distress, Cognitive Bias and Breast Cancer Surveillance Behavior in Women Tested for BRCA 1/2 Mutation

5. FUNDING NUMBERS
DAMD17-99-1-9305

6. AUTHOR(S)

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8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)

U.S. Army Medical Research and Materiel Command
Fort Detrick, Maryland 21702-5012

10. SPONSORING / MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION / AVAILABILITY STATEMENT
Approved for Public Release; Distribution Unlimited

12b. DISTRIBUTION CODE

13. ABSTRACT *(Maximum 200 Words)*

This research project examines psychological distress and processing of information associated with breast cancer risk. Understanding the types and magnitude of women's distress and impaired processing of cancer-related information is critical because cancer-related distress has been associated with poorer compliance with screening behaviors, and impaired processing of cancer information may decrease women's knowledge and understanding of (and hence, compliance with) recommended screening guidelines. These concerns may be particularly salient among women who attend genetic counseling, as they receive complex, and oftentimes-distressing information about their risk for the disease. To date, our findings indicate that women with family histories of breast cancer may be so preoccupied with their risks for developing breast cancer that they underestimate their risks of developing other more common diseases, such as cardiovascular disease. Our research has also demonstrated that distress about breast cancer is related to significantly poorer knowledge of information presented during genetic counseling. Results from Year 1 of this project (laboratory model of cancer-information processing), coupled with present results ("real life" assessment of distress and knowledge after genetic counseling) strongly suggest that women at increased risk for breast cancer may not be adequately processing information critical to their health care, in spite of the fact that they may stand to gain the most from counseling.

14. SUBJECT TERMS	15. NUMBER OF PAGES
breast cancer, genetic counseling, cognition, distress, stroop task	27
	16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified	Unclassified	Unclassified	Unlimited

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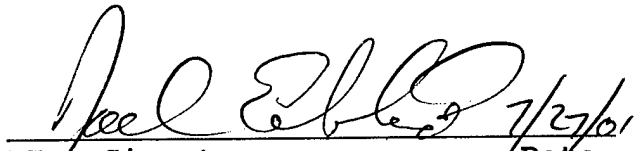

PI - Signature Date

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Introduction

This research project is aimed at examining psychological distress and processing of information associated with risk for breast cancer among women at risk for the disease. To that end, we have been recruiting women with and without family histories of breast cancer and assessing their levels of self-reported distress, their cognitive processing of cancer-related information, and their perceived risks for breast cancer and other diseases. Understanding the types and magnitude of women's distress and impaired processing of cancer-related information is critical because cancer-related distress has been associated with poorer compliance with screening behaviors, and impaired processing of cancer information may decrease women's knowledge and understanding of (and hence, compliance with) recommended screening guidelines. These concerns may be particularly salient among women who attend genetic counseling, as they receive complex, and oftentimes distressing information about their risk for the disease. The research project is one part of a larger training experience for the PI. Accomplishments in both the training and research components of the award to date are described below.

Training Accomplishments

As in the first year of the training program, during the past year, the PI had the opportunity to participate in the diverse didactic training offerings of the Cancer Prevention and Control and Biobehavioral Medicine programs at Mount Sinai. This is in addition to weekly meetings with Mentor Bovbjerg to discuss issues related to the research. Scheduled colloquia, as well as informal lunch meetings with Mount Sinai faculty from the Cancer Center, Departments of Oncology, Radiology, and Human Genetics were regularly attended. In addition, special seminars from invited guest lecturers were periodically scheduled, providing an opportunity to forge broader connections and establish networks of collaboration. For instance, this past year the PI had the opportunity to attend core course lectures from Dr. Christine Ambrosone from the Department of Community Medicine and the Cancer Center who provided an introduction to molecular epidemiological issues surrounding genetic risk for breast cancer. The PI continues to work closely with Ms. Karen Brown, director of Cancer Genetic Counseling in the Department of Human Genetics, who is at the forefront of risk communications to patients. Regular biostatistical core lectures by Dr. Gary Winkel both at the Cancer Center and at the CUNY graduate center provided ample opportunity for development of advanced biostatistical and data-analytic skills. Guest lecturers included TimAhlers and many other noted scholars of biobehavioral medicine. In addition, the PI was afforded the opportunity to teach one class session of the Center's core course, Introduction to Behavioral Medicine, which was attended by physicians, nurses,

medical students, and students in Mount Sinai's genetic counseling program. Through weekly "work-in-progress" meetings, the PI was afforded the opportunity to present his ongoing research, providing a forum to further hone presentation and communication skills. Finally, the PI had the opportunity to both present his work at a national meeting in Seattle, and meet other investigators in the field with similar interests and share ideas.

Research Accomplishments

In this study, we aimed to assess distress and cognitive processing of cancer-related information among women in three groups 1) women with family histories of breast cancer who tested positive for BRCA1/2 mutations; 2) women with family histories of breast cancer who tested negative for BRCA1/2 mutations; and 3) women without family histories of breast cancer who have not undergone genetic testing. We are continuing to experience difficulty recruiting women who test positive for BRCA1/2 mutations because of low base rates for the mutation in the general population. We broadened our recruitment efforts to include affiliate hospitals in the Mount Sinai system (e.g., Elmhurst, St. Barnabus) to increase our access to these women, but were still facing poor accrual. In our initial efforts in Year 1 of the project, we recruited women with family histories of breast cancer who have not undergone genetic counseling. Comparing this group to a group of women without family histories of breast cancer has allowed us to explore the possibility that women with family histories of breast cancer have higher levels of persistent distress and impaired cancer-related information processing than women without such family histories. This endeavor has also allowed us to assess the sensitivity of our primary cognitive task, the cancer Stroop task, in during which subjects are asked to name the color of ink in which cancer-related words are printed on a sheet of paper. Designed to assess the degree to which the actual words distract the subject from the primary task (color naming), we indeed found that women in this study of breast cancer took longer to color-name the cancer word list relative to other comparison word lists (i.e., heart disease, general threat, positive, and neutral color-words). To date, our findings indicate that in this sample, women with family histories reported higher levels of self-reported cancer specific intrusive thoughts and avoidance, and took significantly longer to color-name cancer words (i.e., increased vigilance to the cancer words distracted them from the primary task of color-naming) than did women without family histories of the disease. In further support of our hypothesis, we found a significant relation between objective risk for breast cancer (Gail Model, which includes factors such as age of menarche, age at first live birth, and number of children) and time to color name cancer words, such that those women with the highest levels of objective breast cancer risk took the longest time to color name the cancer words. These findings were significant ($p < .005$), even after controlling for reading ability and education. Interestingly, Stroop reading times were not related to distress levels in

these women, possibly suggesting that the Stroop may be sensitive to aspects of stress that are not being tapped by traditional self-report methods. Finally, consistent with the large body of literature on cognitive processing of anxiety-related stimuli, we found that memory for the cancer words in the Stroop task was poorer for women with family histories of breast cancer and for women with elevated objective risk. These findings suggest that women are initially exhibiting heightened vigilance toward putatively anxiety provoking materials (as evidenced by slower color naming times), but then demonstrate a subsequent cognitive avoidance of those same materials (as evidenced by poorer word recall). These findings were presented at the national meeting of the Society of Behavioral Medicine in Seattle in March, 2001), and the full report is now in manuscript form to be submitted for publication.

Other findings by the PI and Mentor further emphasize the possibility that women at risk for breast cancer experience preoccupation with the disease: we recently found that, in comparison to women without family histories of breast cancer (n = 104), women with family histories of breast cancer (n = 73), while grossly overestimating their risks for breast cancer, also substantially underestimated their risks for developing other diseases, such as colon cancer and heart disease. These findings suggested that the emphasis on breast cancer risk may need to be balanced by educational efforts concerning risks for other diseases. This study was published in Preventive Medicine (see Appendix).

We also completed a small laboratory-based study which demonstrated that thinking (guided imagery) about breast cancer causes increases in stress. In this study, self-reported distress and blood pressure were assessed in a sample of 26 healthy women across three conditions: 1) baseline (no imagery), 2) guided imagery of undergoing mammography, and for the purposes of comparison, 3) guided imagery of taking a trip to the park. Results indicated increased distress, systolic and diastolic blood pressure during and after the mammography imagery, compared to either baseline or neutral imagery conditions. These results were presented at the March, 2001 meeting of the American Psychosomatic Society in Monterey, CA (see Appendix).

In addition to the above research which focused mainly on the impact of familial risk for breast cancer on perceived risk and distress, we have also tested the possibility that the distress associated with thoughts of breast cancer risk would be related to poorer breast cancer knowledge after genetic counseling. In this study, 107 women who underwent genetic counseling completed a 27-item breast cancer knowledge questionnaire, a questionnaire assessing breast cancer related distress, and a measure of general distress. Approximately one week following their counseling session, the women again completed the knowledge questionnaire. Findings indicated that there was a significant increase in knowledge from before to after the genetic counseling session. However there was wide variability among women, with some women showing no improvement. Improvements were smaller for minority women, less educated women, and women with high levels of general distress. These findings support our contention that

distress may play a role in the processing of information provided during genetic counseling. Results were presented in Philadelphia, PA, at the 50th annual meeting of the American Society of Human Genetics in October, 2000 (see Appendix).

Although these data raise the strong possibility that distress may impact breast cancer information processing, the 27-item questionnaire we used has yet to be validated. As a result, with the guidance of genetic counselors, we have also undertaken the development of a broad questionnaire (see Appendix) that assesses knowledge of the range of information provided during genetic counseling. At this time, in an ongoing validation study, the questionnaire is being completed by health care practitioners employed in a cancer setting, health care practitioners employed in other medical settings, genetic counselees, women with family histories of breast cancer who have not attended genetic counseling and women without family histories of breast cancer. To date, 71 subjects have been recruited (additional questionnaires are returned daily) and data analyses are awaiting further accrual. Ultimately, this validated questionnaire will allow us to assess the degree to which knowledge is increased by genetic counseling, and the degree to which psychological distress interferes with that process using an instrument validated to measure knowledge.

Key Research Accomplishments:

- Identified aberrant processing of cancer-related information in women at familial and objective risk for breast cancer
- Identified causal relations between thoughts of breast cancer and self-reported distress and blood pressure increases.
- Demonstrated that familial risk for breast cancer is related to overestimation of breast cancer risk, but underestimation of cardiovascular disease and colon cancer risks.
- Demonstrated that amount of knowledge gained by genetic counselees during counseling is predicted by distress levels.
- Continued development of an instrument to assess knowledge gained during breast cancer genetic counseling (Knowledge Questionnaire)

Reportable Outcomes:

- Original peer-reviewed journal article: Erblich, J., Bovbjerg, D., Norman, C., Valdimarsdottir, H., and Montgomery, G. (2000). *It won't happen to me: Lower perception of heart disease risk among women with family histories of breast cancer.* Preventive Medicine, 31, 714-721.

- Abstract presented at national meeting: Erblich, J., Bovbjerg, D., Valdimarsdottir, H., Montgomery, G., and Cloitre, M. (2001). *Selective processing of cancer-related stimuli among women with family histories of breast cancer.* Annals of Behavioral Medicine, 23, Seattle, WA.

- Abstract presented at national meeting: Bovbjerg, D., Montgomery, G., Erblich, J., Lee, M., Ng, K., and Sloan, R. (2001). *Psychophysiological reactivity to scripted imagery of undergoing mammography screening for breast cancer.* Psychosomatic Medicine, 63, 127, Monterey, CA.

- Abstract presented at national meeting: Brown, K., Valdimarsdottir, H., Erblich, J., Amareld, D., Scheuer, L., Hull, J., McDermott, D., Bovbjerg, D., Hurley, K., and Offit, K. (2000). *Does genetic counseling for breast cancer predisposition increase knowledge?* American Journal of Human Genetics, 67 (Suppl. 2), 106, Philadelphia, PA.

Knowledge of Breast Cancer Genetics and Screening

		True	False	Don't Know	Do you understand the question as written? Y/N
1	50% of inherited genetic information (about breast cancer risk) is passed down from a person's mother.				
2	25% of inherited genetic information (about breast cancer risk) is passed down from a person's father.				
3	A breast cancer gene mutation inherited from a parent is present in every cell of the body.				
4	About ½ of all breast cancers are hereditary.				
5	There is more than one gene that can increase the risk of breast cancer.				
6	A woman who has a mother with a breast cancer gene mutation has a 50% chance of having a gene mutation herself.				
7	A woman who has a sister with a breast cancer gene mutation has a 1 in 4 chance of having a gene mutation herself.				
8	A father can pass down a breast cancer gene mutation to his daughters.				
9	One in 10 women has a breast cancer gene mutation.				
10	All women who have a breast cancer gene mutation will get cancer.				
11	If a woman learned from genetic testing that she does not have a breast cancer gene mutation, then that means the breast cancer in her family cannot be hereditary.				
	If the currently available genetic tests were to indicate that a woman has a breast cancer gene mutation, she is at increased risk for:				
12	Breast cancer				
13	Ovarian cancer				
14	Lung cancer				
15	Bladder cancer				

		True	False	Don't Know	Do you understand the question as written? Y/N
	If a woman who already had breast cancer was found to have a breast cancer gene mutation, she is at increased risk for developing:				
16	Another breast cancer				
17	Ovarian cancer				
18	Lung cancer				
19	Bladder cancer				
20	Women who test positive for breast cancer gene mutations are generally more likely to develop breast cancer at a young age.				
21	A woman with a breast cancer gene mutation has an increased risk of ovarian cancer.				
22	A woman who does not have a breast cancer gene mutation can still get breast cancer.				
23	A man who carries a breast cancer gene mutation has an increased risk of developing breast cancer himself.				
24	If a woman tests positive for a breast cancer gene mutation, her male relatives' risk for developing prostate cancer are lowered.				
25	It is possible to have several relatives with breast cancer solely due to chance.				
26	A woman may be at greater risk for developing breast cancer if she has several close relatives with breast cancer.				
27	A woman may be at greater risk for developing ovarian cancer if she has several close relatives with ovarian cancer.				

		True	False	Don't Know	Do you understand the question as written? Y/N
28	A woman may be at greater risk for developing ovarian cancer if she has several close relatives with breast cancer.				
29	A woman who has her healthy ovaries removed will definitely not get ovarian cancer.				
30	A woman who has her breasts removed will definitely not get breast cancer.				
31	Screening for ovarian cancer often does not detect a tumor until it is more advanced.				
32	SKIP				
33	If a genetic test were to indicate that a woman inherited a breast cancer gene mutation, then she should be screened more often.				
34	If a genetic test were to indicate that a woman did not inherit a breast cancer gene mutation previously identified in her family, she should still practice more frequent breast screening than the general public.				
35	Clinical breast exams can detect breast tumors that cannot be seen on a mammogram.				
36	Ovarian cancer screening is recommended for women at average risk for ovarian cancer.				

37. What is the percentage chance of inheriting a breast cancer gene mutation if one's mother or father carries the mutation?

a. 25%
b. 50%
c. 75%
d. 100%
e. Don't know

38. How many copies of a non-working breast cancer gene must one inherit to be at inherited risk for breast cancer?

a. 0
b. 1
c. 2
d. 3
e. Don't know

). How many copies of a non-working breast cancer gene must one have to actually develop inherited breast cancer?

a. 0
b. 1
c. 2
d. 3
e. Don't know

). How many copies of a working breast cancer gene must one inherit to NOT be at inherited risk for breast cancer?

a. 0
b. 1
c. 2
d. 3
e. Don't know

1. What is the approximate risk that the average woman in the United States will develop breast cancer in her lifetime?

a. 12%
b. 24%
c. 58%
d. 72%
e. Don't know

2. What is the approximate risk that the average woman in the United States will develop ovarian cancer in her lifetime?

a. 1-2%
b. 5-10%
c. 20-25%
d. 40-60%
e. Don't know

3. If a genetic test were to indicate that a woman inherited a breast cancer gene mutation, then how likely is she to develop breast cancer in her lifetime?

a. up to 15% chance
b. up to 25% chance
c. up to 40% chance
d. up to 50% chance
e. up to 85% chance
f. Don't know

4. Unless a woman has a particular risk factor, she should start getting regular mammograms at age:

a. 30
b. 35
c. 40
d. 45
e. 50
f. Don't know

5. Breast self-examination should be performed:

a. once a day
b. once a week
c. once a month
d. once every six months
e. once a year
f. Don't know

6. Select the procedure that is NOT appropriate for the detection of ovarian cancer

a. ultrasound
b. pap smear
c. CA-125 blood test
d. pelvic examination
e. Don't know

7. What is your lifetime risk of developing breast cancer (0-100%)? _____

8. Is your lifetime risk for developing breast cancer higher, lower or about the same as other women your age in the general population?

a. much higher
b. higher
c. about the same
d. lower
e. much lower
f. Don't know

9. Is your lifetime risk for developing ovarian cancer higher, lower or about the same as other women your age in the general population?

a. much higher
b. higher
c. about the same
d. lower
e. much lower
f. Don't know

Additional Items

		True	False	Don't Know	Do you understand the question as written? Y/N
1	Stress has been proven to cause breast cancer.				
2	Over a lifetime, about 1 out of 8 or 9 women will develop breast cancer.				
3	Women who are over 50 years of age are more likely to get breast cancer than younger women.				
4	Out of every 100 women diagnosed with breast cancer, 75 are disease-free after 10 years.				
5	Swelling or enlargement of one breast may be a sign of breast cancer.				
6	Chemotherapy is always used in the treatment of breast cancer.				
7	Women over age 50 should have a mammogram at least every 2 years.				
8	A woman whose mother was diagnosed with breast cancer at age 69 is considered to be at high risk for breast cancer.				
9	Ovarian cancer and breast cancer in the same family can be a sign of hereditary breast cancer.				
10	Testing for breast cancer gene mutations can tell a woman if she has breast cancer.				
11	Men cannot inherit breast cancer gene mutations.				

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SELECTIVE PROCESSING OF CANCER-RELATED STIMULI AMONG WOMEN WITH FAMILY HISTORIES OF BREAST CANCER

Joel Erblich, Ph.D., Dana H. Bovbjerg, Ph.D., Heiddis B. Valdimarsdottir, Ph.D., and Guy H. Montgomery, Ph.D., Mount Sinai School of Medicine, and Marylene Cloitre, Ph.D., Weill Medical College of Cornell University, New York, NY

Considerable evidence indicates that individuals exhibit selective vigilance toward stimuli related to sources of stress, but subsequently avoid further processing of the same stimuli. We hypothesized that women with the stress of having a family history of breast cancer (FH+) would exhibit greater vigilance to, but poorer subsequent recall of, cancer-related stimuli than women without family histories of breast cancer. A modified Stroop task was administered to FH+ (n=37) and FH- (n=76) women. In this task, the women named (as fast as possible) the colors in which cancer- and non-cancer-related words were printed, ignoring the actual words. Longer color-naming times would indicate increased interference by (and hence, vigilance to) the stimulus words. Women were then given an implicit recall task of the previously administered cancer and non-cancer words. Consistent with study hypotheses, FH+ women took longer to color-name cancer words relative to non-cancer words than did FH- women ($p<.05$), and exhibited poorer recall of cancer words than FH- women ($p<.05$). Such alterations in information processing are likely to have important clinical implications, as these women must process cancer-related information (screening guidelines, options for chemoprevention, prophylactic surgery, etc.) critical in making informed decisions about their health care.

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COGNITIVE PROCESSING OF FEAR IN MOTHERS OF PEDIATRIC STEM CELL TRANSPLANT PATIENTS

K. DuHamel, N. Nereo, S. Manne, J. Ostroff, R. Martini, S. Parsons, S. Williams, L. Mee, S. Sexson, and W. Redd

Use of stem cell transplant (SCT) to treat pediatric disease has grown over the past decade. Intensity of SCT and uncertainty about survival are major stressors for patients and their families. Mothers are at particular risk for psychological distress, as they are often primary caregivers during transplant. Application of a cognitive processing model to mothers' adjustment to their child's SCT was examined. Bewteen 70 to 144 days after their child's SCT, eighty-three women were interviewed about their fears, intrusive thoughts, and avoidance of reminders of their child's illness, as well as depressive symptoms. Regression analyses were conducted to assess a model of components in the following order: medical risk (e.g., type of SCT), fears, intrusive thoughts, avoidance and depression. The model was significant (R Square = .38; $p < .000$); results indicated that the relation of fears and depression was partially mediated by intrusive thoughts (fear beta before and after inclusion of intrusive thoughts = .477; $p < .000$ and .328, $p < .003$, respectively). In turn, the relation of intrusive thoughts and depression was fully mediated by avoidance (intrusive thoughts beta before and after inclusion of avoidance = .295, $p < .008$ and .089, $p < .480$, respectively; avoidance beta = .347, $p < .005$). These data support the application of a cognitive processing model to mothers' self-reports and suggest that interventions targeting the reduction of fears may prevent subsequent distress. Study limitations include the cross-sectional nature of the design; longitudinal assessments are currently underway.

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HEALTH STATUS AND CONTROL BELIEFS PREDICT CANCER PAIN

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Health control beliefs have been shown to correlate with adjustment to illne Less research has examined control beliefs and pain. Based on t Biopsychological model of control, we hypothesized that cancer patients wo be more likely to experience pain if they believed they could control the cou of their illness. We also hypothesized that current disease stage (i.e. disease verity) would moderate these relations such that the association between p and internal health locus of control (IHLOC) would be strongest for those w advanced (i.e. less controllable) disease. Eighty-three participants (59 fema 24 male), aged 29–83 (M=56.19) receiving outpatient chemotherapy comple the Brief Pain Inventory (BPI) and the Multidimensional Health Locus of C trol (MHLC) scales. Cancer stage was divided into 2 groups: Local (more c trollable)=stages 1–2 (n=49) and Advanced (less controllable)=stages (n=34). Logistic regressions were conducted on responses to "Have you e had pain due to your current disease?" from the BPI. A significant effect w found for Stage (Beta=–1.47, p=.004). The interaction of Stage with IHL was significant on the final step (Beta=.28, p=.005). Univariate analyses vealed significant relations between IHLOC and pain for the Local gro (b=–.15, p=.01) only [Advanced: (Beta=.12, p=.10)]. Results indicate t greater beliefs in personal control over illness course were associated wit greater likelihood of reporting disease-related pain, but only for participants stages I and II. This suggests the need for examining further the conditions un which control beliefs may be associated with pain.

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MARITAL SATISFACTION IN THE LONG-TERM PHYSCIAL AND PSYCHOLOGICAL ADAPTATION OF WOMEN TO BREAST AND OVARIAN CANCER

Steven C. Palmer, Ph.D., Melissa Racioppo, Ph.D., Ashraf Kagee, Ph.D., Ric ard Thompson, Ph.D., and James C. Coyne, Ph.D., Comprehensive Cancer Ce ter, University of Pennsylvania

The experience of cancer and treatment confronts individuals with physical a emotional challenges. Adaptation to these challenges may be facilitated or i hibited by both physical and interpersonal factors. We examined physical a emotional outcomes in a sample of women (n=115) with a history of breast ovarian cancer who were enrolled in a hereditary cancer registry. Participar had a mean age of 48.7 years. Intensity of treatment was assessed via the numb of different treatment protocols participants underwent. Distress was assess using the Hopkins Symptom Checklist-25, and overall functioning was assess with the SF-36 Health Survey. Participants typically reported undergoing 2 medical protocols in the treatment of their cancer. Although assessment to place an average 7 years after diagnosis, treatment intensity continued to predi interference in functioning due to bodily pain ($p < 0.05$) and marginally pr dicted limitations in physical role functioning ($p = 0.08$). Better marital adjus ment predicted decreased psychological distress ($p < 0.00$), and more positi outcomes in terms of general health functioning ($p < 0.00$), vitality ($p < 0.0$ mental health ($p < 0.00$), emotional functioning ($p < 0.01$), social functioning < 0.01), and physical role functioning ($p < 0.01$). Better marital adjustment ma ginally predicted better outcomes with pain ($p < 0.07$) and overall physical fun tioning ($p < 0.09$). These relationships remained significant after controlling f both treatment intensity and time since diagnosis. Results add to the increasi body of evidence concerning the important role of social relationships long-term adjustment to cancer.

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regression identified predictors. For women with FDRs with BOC: Total Distress (p<.001), Ashkenazi ethnicity (p<.007), number of FDRs w/BOC (p<.01) predicted QOL-Physical Health; Total Distress (p<.001), Somatization (p<.02) predicted QOL-Subjective Well-Being; Obsessiveness (p<.001), Somatization (p<.001), HLOC-Internality (p<.001), number of FDRs w/BOC (p<.002) predicted QOL-Work; Total Distress (p<.001) predicted QOL-Household Duties; number of second-degree relatives (p<.004) predicted QOL-Leisure Activities; Obsessiveness (p<.004) predicted QOL-General Activities. For women without FDRs with BOC: Somatization (p<.001), age (p<.001) predicted QOL-Physical Health; Depression (p<.003), number of second-degree relatives (p<.04) predicted QOL-Subjective Well-Being; Depression (p<.02), Anxiety (p<.002), employment (p<.002), predicted QOL-Work; HLOC-Powerful Others (p<.001) and Chance (p<.001) predicted QOL-Household Duties; HLOC-Powerful Others (p<.02) predicted QOL-Leisure Activities; HLOC-Powerful Others (p<.02), marital status (p<.05) predicted QOL-Social Relationships; HLOC-Powerful Others (p<.006), personal cancer history (p<.006), marital status (p<.02) predicted QOL-General Activities. Findings suggest differences in determinants of Quality of Life for women seeking genetic testing are based on family experience with breast/ovarian cancer.

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PREDICTORS OF BREAST CANCER-RELATED POSTTRAUMATIC GROWTH

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Although many individuals report positive life changes due to having cancer, little is known about factors associated with these perceptions. Data collection is on-going in this cross-sectional study seeking to identify correlates of posttraumatic growth among women with primary breast cancer. Participants (n = 40; mean age = 53.9 years old; mean time since diagnosis = 10.4 months) provided medical and sociodemographic information and completed the Posttraumatic Growth Inventory (PTGI), the PTSD Checklist, the FACT Spiritual Well-Being Scale, and the Yale Social Support Scale. PTGI scores were unrelated to PTSD symptoms, well-being, and social support. In multiple regression analyses, age, education, type of surgery, and whether or not breast cancer met the PTSD stressor criteria accounted for 43% of the variance in PTGI total scores, $F(4, 35) = 6.56$, $p < .001$. Greater posttraumatic growth was significantly associated with younger age, beta = -.41, $p < .01$, and marginally associated with higher education, beta = .23, $p = .09$, having a mastectomy, beta = .25, $p = .06$, and cancer meeting the PTSD stressor criteria, beta = .25, $p = .07$. Greater threat posed by cancer and greater resources to deal with this threat may set the stage for personal growth. Findings are consistent with existential theory and suggest that stressful health experiences such as diagnosis and treatment of breast cancer have the potential to elicit both distress and positive life change.

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PREDICTORS OF PSYCHOLOGICAL DISTRESS FOR WOMEN SEEKING BRCA1/BRCA2 GENETIC TESTING: IMPACT OF FAMILY CANCER HISTORY

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Psychological distress has been noted to impact psychological functioning, the genetic risk notification process, and the practice of breast cancer surveillance behaviors for women seeking BRCA1/BRCA2 genetic analysis. However little work has been done to examine both the factors related to distress and the impact of family history of breast/ovarian cancer (BOC) in these women. The Hopkins Symptom Checklist was used to assess psychological distress in community women seeking BRCA1/BRCA2 genetic mutation testing (n=66; mean age=43.8, range: 26.4 to 76.8; 83% were married; 80% had some college or a college degree; 12% were Ashkenazi Jewish). These women had on average 1.48 first-degree relatives (FDRs) and 2.58 second-degree relatives with cancer; 50% had a personal cancer history. Stepwise multiple regression analysis identified predictors. For women with FDRs with BOC, Multidimensional Health Locus Of Control Internality (p<.008), younger age (p<.007) and personal cancer history (p<.014) were predictive of Somatization; number of breast biopsies (p<.03), second-degree relatives (p<.01), and younger age were predictive of Obsessiveness; Ashkenazi ethnicity (p<.03) was predictive of Interpersonal Sensitivity; Ashkenazi ethnicity (p<.007) and FDRs with other cancers were predictive of Depression; and younger age (p<.007) and Ashkenazi ethnicity (p<.04) were predictive of Total Distress. For women without FDRs with BOC, Ashkenazi ethnicity (p<.03) was predictive of increased levels of Anxiety. These findings support a psychological impact of family cancer history. Early recognition and intervention may moderate levels of distress in community women presenting for BRCA1/BRCA2 genetic testing.

1421

PSYCHOPHYSIOLOGICAL REACTIVITY TO SCRIPTED IMAGERY OF UNDERGOING MAMMOGRAPHY SCREENING FOR BREAST CANCER

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Background: Nonadherence to cancer screening guidelines remains a major public health problem, which has not yielded to traditional theories of rational decision-making. The potential impact of nonvolitional influences (emotions and related visceral factors) has only recently begun to be examined, in part due to a paucity of assessment tools. Based on previous studies indicating that psychobiological responses to mental imagery are similar to those seen during actual stressful events, the objective of the study was to examine reactivity to scripted imagery of undergoing mammography screening for breast cancer, as a possible assessment tool for future studies of the contribution of nonvolitional factors to cancer screening decisions.
Methods: Using a within subjects design in a laboratory setting, self-reported distress (visual analog scale) and blood pressure (continuous monitoring) were assessed in a sample of 26 healthy women (mean age 35.3 years), (39% white, 49% black) across three stimulus conditions (5 min each): 1) no imagery (baseline), 2) neutral imagery (park), 3) mammography imagery; each was followed by a music-rest period (4 min).
Results: Repeated measures analysis of variance followed by post hoc contrasts revealed significantly ($p<.05$) higher levels of distress, as well as significantly increased systolic and diastolic blood pressure during and after the mammography imagery, compared to either baseline or neutral imagery conditions; no differences were found in self-reported vividness of the two imagery conditions.
Conclusions: The results indicate that mental imagery of undergoing mammography screening for breast cancer is stressful, and suggest the potential utility of this laboratory model for investigating the impact of nonvolitional factors on cancer screening decisions.

Program Nr: 524

Does genetic counseling for breast cancer predisposition increase knowledge? *K. Brown[1], H. Valdimarsdottir[2], J. Erblich[2], D. Amareld[3], L. Scheuer[3], J. Hull[3], D. McDermott[3], D. Bovbjerg[2], K. Hurley[2], K. Offit[3]*. 1) Dept Human Genetics, Mount Sinai School of Medicine, New York, NY; 2) Cancer Prevention and Control, Mount Sinai School of Medicine, New York, NY; 3) Dept Human Genetics, Memorial Sloan-Kettering Cancer Center, New York, NY.

An important goal of genetic counseling for cancer predisposition is to improve knowledge about a range of topics, including principles of genetics and oncology, risks for cancer, and options for screening and primary prevention. However, there are little published data on knowledge and comprehension following genetic counseling for breast cancer. Therefore, the major aims of the present study were: 1) to examine the effectiveness of genetic counseling in improving general knowledge about breast cancer/genetics; and 2) to determine if the effectiveness of counseling is related to demographic and psychosocial factors. Participants were 107 women attending individual genetic counseling sessions for breast cancer susceptibility at Memorial Sloan-Kettering Cancer Center in New York. Approximately one week prior to their counseling session, the women completed measures of: 1) breast cancer knowledge (a 27-item questionnaire); 2) cancer specific distress (Impact of Events Scale); and 3) general distress (Profile of Mood States). Approximately one week following their counseling session, the women again completed the knowledge questionnaire. There was a significant increase in knowledge from before to after the genetic counseling session (p=.0001). However, there was a wide variability among the women, with no improvement in knowledge among some women. The counseling was less effective for minority women (p=.007), less educated women (p=.05), and women with high levels of general distress (p=.003). When all of these variables were entered together into the equation, ethnicity and general distress remained significant while education was no longer significant. These findings suggest that some women may require different counseling protocols if genetic counseling is to be effective in educating them about their risks and options.

Session Information/Title	Session Date/Time
Session Type: POSTER	**Presentation Date/Time:**THU. 4:30-6:30PM
Location: HALL A	**Session Date/Time:** WED 10:30AM-8:00PM, THU 7:00AM-8:00PM FRI 7:00AM-3:00PM, SAT 7:00AM-2:00PM
Session Title: CANCER GENETICS	

Abstract Information/Title

Program Number: 524, **Presentation Time:** THU. 4:30-6:30PM

Title: DOES GENETIC COUNSELING FOR BREAST CANCER PREDISPOSITION INCREASE KNOWLEDGE?

Authors: K. BROWN,* H. VALDIMARSDOTTIR, J. ERBLICH, D. AMARELD, L. SCHEUER, J. HULL, D. MCDERMOTT, D. BOVBJERG, K. HURLEY, K. OFFIT.

Keywords: CANCER GENETICS, GENETIC COUNSELING AND GENETIC EDUCATION, PUBLIC, PATIENT AND PROFESSIONAL EDUCATION, COUNSELING, PSYCHOSOCIAL ISSUES

View The Abstract

Preventive Medicine 31, 714–721 (2000)
doi:10.1006/pmed.2000.0765, available online at http://www.idealibrary.com on IDEAL®

It Won't Happen to Me: Lower Perception of Heart Disease Risk among Women with Family Histories of Breast Cancer[1]

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Background. **The threat that breast cancer poses to American women, particularly to women with family histories of the disease, has received widespread attention in both medical and popular literatures. While this emphasis may have laudable consequences on breast cancer screening, it may also have a negative consequence, obscuring women's recognition of their risks for other health threats, such as heart disease. This study examined the possibility that women with family histories of breast cancer may be particularly susceptible to overestimating their risks of breast cancer while minimizing their risks of cardiovascular disease.**

Methods. **Healthy women with (n = 73) and without (n = 104) family histories of breast cancer (64% African American, 26% Caucasian, 10% other ethnicities, mean age 41.7 years) were recruited from medical centers in New York City, and completed questionnaires concerning their family histories and perceptions of risk.**

Results. **Consistent with the study hypothesis, women with family histories of breast cancer had significantly higher perceived lifetime risk of breast cancer ($P < 0.0002$) but lower perceived lifetime risk of heart disease ($P < 0.002$) than women without family histories. Additionally, women with family histories of breast cancer had lower perceived colon cancer risk ($P < 0.02$), suggesting that women with family histories of breast cancer may be underestimating their risks for a variety of diseases.**

Conclusion. **The emphasis on breast cancer risk, especially for women with family histories of the disease, may need to be balanced by educational efforts concerning women's risk of other diseases, particularly cardiovascular disease.**

Key Words: **family history; breast cancer; heart disease; perceived risk.**

INTRODUCTION

Breast cancer is the most frequently diagnosed cancer among women in the United States [*1*]. Current estimates suggest that one of every eight women in the United States (12.5%) will develop breast cancer at some point during her lifetime. Having a first-degree relative with breast cancer places a woman at an even higher lifetime risk for developing the disease [*2*]. Indeed, research has demonstrated that these women are aware of their increased risk. A number of studies (e.g., [*3,4*]) have repeatedly found that perceptions of breast cancer risk among women with family histories of breast cancer are significantly higher than among women without family histories of breast cancer and far higher than objective estimates. Indeed, a number of studies (e.g., [*5–7*]) have demonstrated that American women in general markedly overestimate their risk of developing the disease, with many women perceiving themselves to be at extremely high lifetime risk. For example, Helzlsouer *et al.* [*6*] found that even employees in an oncology center, whom one might expect to be more knowledgeable than lay people, perceived themselves to be at greater than 40% lifetime risk. Evans *et al.* [*7*] found that while some women with family histories of breast cancer underestimated their risk, most overestimated their risk and many overestimated their risk by more than 50%. Several recent studies (e.g., [*8,9*]), noting the large scale dissemination of breast cancer-related information in women's magazines and other media, suggest the distinct salience of breast cancer in the lives of women in the United States.

[1] This research was sponsored in part by grants from the National Cancer Institute (R01 CA72457; Bovbjerg) and the Department of Defense (DAMD 17-99-1-9305; Erblich). We are required to indicate that the content of the information contained in this report does not necessarily reflect the position or policy of the United States Government.

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0091-7435/00 $35.00

The salience of the threat of breast cancer, particularly for women with family histories of breast cancer, raises the possibility that women may have a poorer appreciation of their risk for developing other diseases, chief among which is heart disease, which typically poses a greater lifetime risk than does breast cancer. A recent report based on data from the Framingham Heart Study, a large-scale, longitudinal cohort study, has indicated that women's lifetime risk of developing heart disease is approximately 32% [*10*]. This risk level is almost three times that of breast cancer, and is even higher for women with family histories of heart disease [*11*]. Heart disease kills almost three-quarters of a million Americans annually and is currently the leading cause of death among women in the United States [*12*]. Nevertheless, recent studies [*13,14*] have found that far more women in the general population report being concerned about breast cancer than about heart disease. Indeed, a recent population-based survey found that only a small minority of women identified heart disease as their greatest health concern, and most women were not aware that heart disease was the leading cause of death [*15*].

Inappropriately low perceptions of risk for disease can be problematic, as they have been linked to poor compliance with recommended health behaviors and screening for the disease in question (see McCaul *et al.* [*16*]). For example, Lerman *et al.* [*17*] found that women who perceive themselves to be at lower than average risk for breast cancer are significantly less likely than others to comply with recommended guidelines for breast self-examination and mammography. Price [*18*] and others (e.g., [*19*]) have found that perceptions of risk for colorectal cancer are positively related to compliance with screening (e.g., sigmoidoscopy). Avis *et al.* [*20*] proposed that women who perceive themselves to be at lower than average risk for heart disease may be less likely to follow a healthy diet and exercise regimen and less likely to be screened regularly for hypertension. In light of these considerations, a better understanding of the predictors of risk perception could have important implications for women's health.

To our knowledge, the potential impact of having a family history of breast cancer on women's perceptions of their risk for developing heart disease has never been examined. Indeed, little attention has been given to any factors predicting individual's perceptions of their heart disease risk. For women with family histories of breast cancer, heightened concerns about that disease might overshadow their appreciation of their heart disease risk, which is no less in this population [*21,22*]. The present study examined the hypothesis that women with family histories of breast cancer, known to have particularly high perceptions of breast cancer risk, may have lower perceptions of heart disease risk than women without family histories of breast cancer. Support for this view comes from Weinstein [*23,24*], who has theorized that individuals with family histories of a disease have had a personal connection to the disease, and may therefore be excessively focused on their risk for that disease. Based on these theoretical considerations, we predicted that women with family histories of breast cancer would have lower perceptions of heart disease risk than women without such family histories. Additionally, as CDC annual mortality data suggest that African American women have particularly high rates of mortality from heart disease [*25*], we also explored potential ethnicity-related differences in perceived risk.

METHOD

Subjects

One hundred seventy-seven women participated in the study. As part of a larger study of the psychobiological effects of stress, subjects were recruited by advertisements (for a "mind–body" study of women with and without family histories of breast cancer) placed in three medical centers in New York City. We targeted recruitment for women who had family histories of breast cancer to ensure adequate representation. Fewer than 10% of women refused to participate once contacted. To reduce sources of extraneous variability in risk perceptions, all women were required to be healthy by self-report with no personal history of cancer, heart disease, or other serious chronic illness (e.g., diabetes) at the time of the assessment. Women who did not satisfy these criteria were excluded from the study. Subjects were told that they would be asked to fill out several questionnaires pertaining to their general health, as well as their attitudes and beliefs about breast cancer and other diseases.

Mean age of the sample was 41.7 years (SD = 10.1, range 25.2–71.3). Sixty-four percent of the women were African-American, 26% were Caucasian, and 10% represented other ethnicities. Women's education levels were varied; 8% of the women had not completed high school, 45% of the women had completed high school or some college, and 47% had completed college. About a third of the women reported earning under $20,000 annually, 47% earned $20,000 to $60,000, and 19% earned more than $60,000 annually. Thirty-five percent of the women were currently married. Seventy-three women had family histories of breast cancer in a first-degree relative (the "FHBC+ Group") and 104 women did not have family histories of breast cancer in a first-degree relative (the "FHBC− Group").

Measures

Subjects completed questionnaires assessing demographics, general health variables, and family histories

of cancer and heart disease. Demographic variables were dichotomized to facilitate analyses (see Table 1). Self-reports of cancer and heart disease in family members, particularly first-degree relatives, have been found to be reliable [*11*]. Subjects also reported how likely they thought they were to develop breast cancer sometime during their lives, on a scale of 0% (not at all likely) to 100% (extremely likely). Using the same scale, subjects also reported how likely they thought they were to develop heart disease sometime during their lives, and, for purposes of comparison, how likely they thought they were to develop colon cancer sometime during their lives (for which actual lifetime risk among women is estimated at 5.6% [*1*]). These perceived risk measures have been used previously in studies by us (e.g., [*3,26*]) and others (e.g., [*27,28*]), and have demonstrated stability over time (test–retest reliability = 0.85; [*3*]) and criterion validity [*3,26*].

Procedures

The study was conducted under IRB approval. Subjects provided written informed consent prior to participation. Questionnaires were completed in the presence of an investigator who was available to clarify any items. Subjects were offered $20 plus the cost of public transportation to and from the study visit.

Data Analysis

To address the study hypotheses, we compared perceptions of breast cancer, heart disease, and colon cancer risk (outcome variables) in women with and without family histories of breast cancer (predictor variable). Because some studies have suggested that demographic variables such as age, education, income, and ethnicity are predictive of variability in perceived risk for breast cancer (e.g., [*29*]) and heart disease (e.g., [*20*]), we considered these variables possible covariates in the analyses. Thus, in a preliminary set of analyses, we examined relations between demographic variables (age, education, income, and ethnicity) and indices of perceived risk. Interestingly, none of these factors was related to the perceived risk indices (Table 1). Following the recommendation of Baron and Kenny [*30*], who argue that covariates must be related to both predictors and outcomes to be included in a model, these variables were excluded from further analyses. Because having a family history of heart disease in a first-degree relative (e.g., myocardial infarction, angina pectoris; $n = 78$)

TABLE 1

Perceived Risk and Demographics

	Perceived risk (0–100%) ± SE		
	Breast cancer	Heart disease	Colon cancer
Age (median 41.4 years)[1]			
Above median ($n = 89$)	41.9 ± 2.8	36.0 ± 3.3	23.0 ± 2.7
Below median ($n = 88$)	41.0 ± 2.9	31.7 ± 2.9	22.0 ± 2.5
Education			
Completed college ($n = 83$)	41.2 ± 2.8	34.7 ± 3.0	21.6 ± 2.8
Did not complete college[2] ($n = 94$)	41.5 ± 2.9	33.2 ± 3.1	23.2 ± 2.4
Income[3]			
$40,000/year or above ($n = 63$)	46.9 ± 3.2	33.9 ± 3.3	22.1 ± 2.7
Less than $40,000/year ($n = 113$)	39.0 ± 2.6	34.2 ± 2.9	23.0 ± 2.5
Ethnicity[4]			
African-American ($n = 113$)	42.5 ± 2.6	34.3 ± 2.9	25.4 ± 2.6
Caucasian ($n = 46$)	43.4 ± 3.8	33.4 ± 3.9	20.1 ± 2.6
Smoking history (lifetime)			
Yes ($n = 77$)	45.3 ± 3.0	37.3 ± 3.6	25.6 ± 3.1
No ($n = 99$)	38.2 ± 2.7	31.5 ± 2.7	20.3 ± 2.3
Family history of breast cancer			
FHBC− ($n = 104$)	35.1 ± 2.5[a]	40.3 ± 2.7[b]	26.4 ± 2.4[c]
FHBC+ ($n = 73$)	50.0 ± 3.1[a]	27.0 ± 3.3[b]	17.3 ± 2.9[c]
Family history of heart disease			
FHHD− ($n = 99$)	43.2 ± 2.7	27.0 ± 2.8[d]	20.7 ± 2.5
FHHD+ ($n = 78$)	39.0 ± 3.0	42.7 ± 3.2[d]	24.7 ± 2.8
At least 1 female relative ($n = 43$)	35.1 ± 4.1	43.4 ± 5.0	20.6 ± 3.8
Male relative only ($n = 35$)	43.7 ± 4.6	41.9 ± 4.8	29.8 ± 4.9

[1] Age as a continuous variable did not correlate significantly with perceived risk indices.
[2] Includes 15 participants who did not complete high school.
[3] One participant did not report income.
[4] Other ethnicities were insufficiently represented to yield a meaningful comparison.
[a–d] Matching superscripts differ significantly: [a] $P < 0.0002$; [b] $P < 0.002$; [c] $P < 0.02$; [d] $P < 0.0003$.

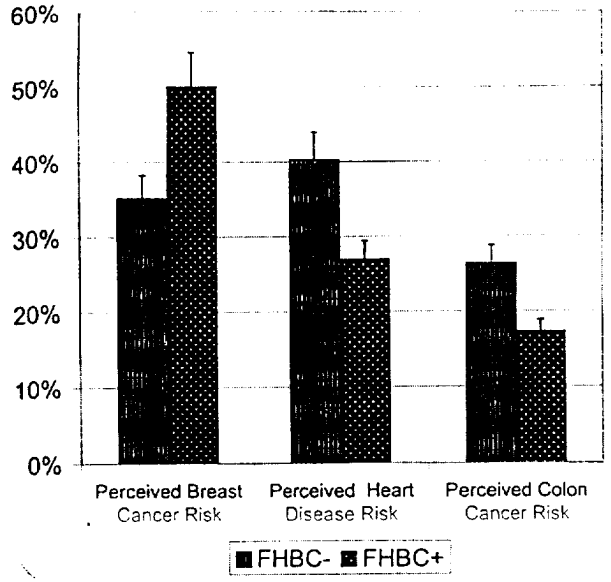

FIG. 1. Perceived risk for disease among women with and without family histories of breast cancer.

was related to perceived heart disease risk (see Table 1), we included this variable as a covariate in our analyses. (We did not include having a family history of colon cancer as a covariate because insufficient numbers of women had family histories of that disease.) Next, we performed simple, zero-order correlations on our three perceived risk variables to ascertain dependence. As perceived breast cancer, heart disease, and colon cancer risks were modestly intercorrelated (P values < 0.05), we performed a mixed-model factorial ANOVA with family history of breast cancer (FHBC+/−) as a between-group factor and perceived risk type (breast cancer, heart disease, colon cancer) as a within-subjects factor, yielding a 2 (FHBC) × 3 (Perceived Risk Type) design. To take a conservative approach, we used Greenhouse–Geisser-corrected significance levels [*31*]. Simple effects analyses (between-group comparisons) were calculated using independent t tests of least-squared means for unbalanced designs with a modified Bonferroni correction for Type I error [*32*]. Because some women ($n = 35$) had male first-degree relatives with heart disease, we added gender of the affected relative as a covariate. We examined the interaction of Perceived Risk Type × FHBC to test our primary hypothesis.

RESULTS

Demographic/Background Variables as Predictors of Perceived Risk

The women's age, education, income, ethnicity, and smoking history were not related to their perceived risks of the three diseases (Table 1). As expected, having a family history of heart disease (but not the gender of the affected relative) was related to higher perceived heart disease risk. FHHD +/− was, therefore, included as a covariate in the analyses examining the study's primary hypothesis concerning family history of breast cancer.

Family History of Breast Cancer as a Predictor of Perceived Risk

Consistent with the primary study hypothesis, women with family histories of breast cancer (FHBC+) had higher perceptions of breast cancer risk, but lower perceptions of heart disease risk, and lower perceptions of colon cancer risk, than did women without family histories (FHBC−), as shown in Fig. 1. Statistical analysis (ANOVA) yielded a significant FHBC × Perceived Risk Type interaction; $F(2,346) = 25.26$, $P < 0.0001$. Planned comparisons (between groups) indicated that while FHBC+ women had higher perceived breast cancer risk than did FHBC− women, $t(175) = 3.74$, $P < 0.0002$, they had lower perceived heart disease risk than FHBC− women; $t(175) = 3.13$, $P < 0.002$, and lower perceived colon cancer risk than FHBC− women, $t(175) = 2.42$, $P < 0.02$ (see Table 1).

As shown in Table 2, FHBC+ and FHBC− women did not significantly differ in age, education, ethnicity, smoking history, or perceived physical health. In addition, FHBC+ women had family histories of heart disease at a statistically comparable rate to that of FHBC− women. In this sample, FHBC+ women were more likely to report earning above $40,000 annually than

TABLE 2

Comparison of Women with (FHBC+) and without (FHBC−) Family Histories of Breast Cancer and with (FHHD+) and without (FHHD−) Heart Disease

	FHBC+ ($n = 73$)	FHBC− ($n = 104$)
Age (% above median)	53.4	48.1
Education (% completed college)	38.4	52.9
Income (% 40K or greater)	45.2[a]	29.7[a]
Ethnicity (% African-American)	65.1	75.3
Smoking history (% ever smoked)	45.8	42.3
Family history of heart disease (% FH+)	41.1	46.1
Perceived physical health (% high)	56.2	61.5
	FHHD+ ($n = 78$)	**FHHD− ($n = 99$)**
Age (% above median)	57.7	44.4
Education (% completed college)	53.8	41.4
Income (% 40K or greater)	42.9	30.9
Ethnicity (% African-American)	62.3	77.8
Smoking history (% ever smoked)	45.4	42.4
Family history of breast cancer (% FH+)	38.5	43.4
Perceived physical health (% high)	56.4	61.6

[a] $P < 0.05$.

FHBC− women. As indicated above, however, income was not related to any of the perceived risk indices.

Family History of Heart Disease as a Predictor of Perceived Risk

Because a significant subset of women in the study had family histories of heart disease (see above), we were able to explore the possibility that an analogous pattern of results would emerge for these women. Hence, we tested the possibility that women with family histories of heart disease (FHHD+) would have higher levels of perceived heart disease risk, but lower levels of perceived breast and colon cancer risks than women without family histories of heart disease (FHHD−). In contrast to our findings regarding family history of breast cancer, we found that, while FHHD+ women had higher levels of perceived heart disease risk than FHHD− women, they did not differ significantly from FHHD− women in their levels of perceived breast and colon cancer risks (Fig. 2). Statistical analysis (ANOVA) indicated that this FHHD × Perceived Risk Type interaction was significant; $F(2,346) = 9.05$, $P < 0.0002$. To further characterize this interaction, we performed simple effects analyses (between groups), which revealed that the FHHD+ women had higher perceived heart disease risk than did the FHHD− women, $t(175) = 3.55$, $P < 0.0005$, but did not differ in their perceptions of breast cancer risk, $t(175) = 0.72$, $P < 0.47$, or colon cancer risk, $t(175) = 0.89$, $P < 0.38$. Thus, as expected, perceptions of heart disease risk among FHHD+ women were significantly higher than among FHHD− women (Table 1), but FHHD+ women did not display a concomitant decrement in perceived risk for the other two diseases. Similar results were found when we restricted the family history criteria to include only women with first-degree relatives who suffered a myocardial infarction ($n = 55$), a more severe form of heart disease than other forms (e.g., angina pectoris). FHHD+ and FHHD− women did not differ on any of the demographic/background variables (Table 2).

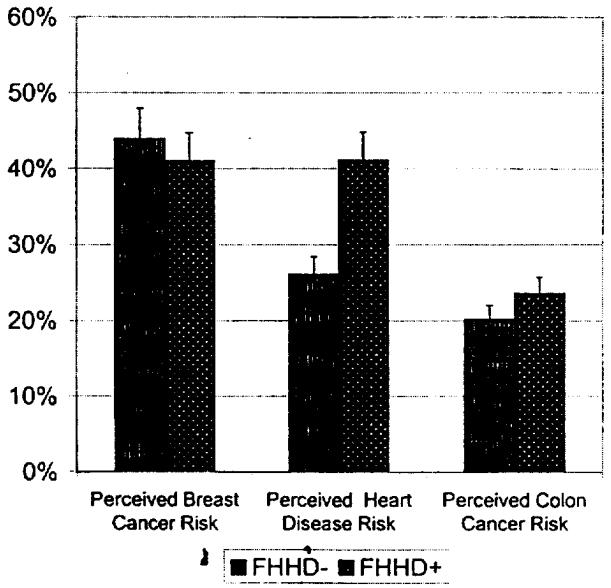

FIG. 2. Perceived risk for disease among women with and without family histories of heart disease.

DISCUSSION

Consistent with the primary study hypothesis, we found that women with family histories of breast cancer had significantly higher perceptions of risk for developing breast cancer, but significantly lower perceptions of risk for developing heart disease and colon cancer than women without family histories of breast cancer. In contrast, women with family histories of heart disease had higher levels of perceived risk of developing that disease than women without such family histories, while their levels of perceived risk for breast and colon cancer did not differ from those of women without family histories of heart disease. Interestingly, African American women, who are known to have higher levels of mortality from both heart disease and breast cancer, did not significantly differ from Caucasian women in their levels of perceived risk for the diseases.

These findings are consistent with the model of risk perceptions advanced by Weinstein [*23,24*], in that having a family history of a disease was associated with increased risk perceptions for development of that disease. Contrary to Weinstein, however, we found that in this sample, having a family history of a disease was not always necessarily related to lower perceived risk of other diseases. The inverse relation held when examining women with and without family histories of breast cancer, but not when examining women with and without family histories of heart disease. Thus, the results with this sample of women do not provide support for a general contention that having a family history of any one disease is necessarily related to decreased perceived risk for other diseases.

The specific factors responsible for the lower perceptions of heart disease and colon cancer among women with family histories of breast cancer have yet to be determined. Several possibilities deserve further attention. First, in addition to perceiving themselves to be at high risk of developing breast cancer during their lifetime (addressed in this study), women with family histories of breast cancer may believe that they are at risk of developing the disease at a younger age and of dying from the disease before other health risks would be likely to develop. Second, women with family histories of breast cancer may selectively attend to the high levels of breast cancer information available through the media [*8*], and gloss over messages about other diseases. If this is the case, they may not be sufficiently

informed about heart disease or colon cancer to recognize their risks of those diseases. Third, clinicians of women with family histories of breast cancer may emphasize risk of that disease and spend less time discussing risks of other diseases.

Our finding that women with family histories of heart disease did not have lower perceived breast or colon cancer risk than women without such family histories, even after employing a stricter definition of FHHD (i.e., myocardial infarction only) is consistent with studies suggesting that saturation of cancer-related issues in the media has sensitized the general population to heightened awareness of cancer risk [*8*]. In addition to the potentially direct impact of the media on perceived risk, there may be indirect effects resulting from high levels of negative images of cancer as an inexorable, debilitating, and deadly disease, whose treatment is highly aversive. To the extent that thoughts about cancer are more aversive than thoughts about heart disease, such thoughts may result in an overestimation of risk for breast cancer, consistent with an extensive body of research (e.g., [*33*]) suggesting that people overestimate their risks for particularly aversive events (e.g., plane crashes). It is possible, therefore, that the combination of high media exposure and the aversive nature of cancer may sensitize even FHHD+ women, such that their perceptions of cancer risk remain comparable to those of FHHD− women. Indeed, in the present study, women's perceptions of risk of breast cancer were substantially inflated (compared to actual risk estimate of 12. 5%), possibly suggesting a more general tendency to view breast cancer as more aversive and threatening. Whether individuals with family histories of other highly aversive diseases (e.g., ALS) would show a similar pattern of perceived risks remains to be examined.

The dramatic overestimation of breast cancer risk found in the present study is consistent with our previous findings in another sample [*26*], as well as those of Helzlsouer *et al.* [*6*] who have reported that American women substantially overestimate their breast cancer risk. These findings, together with the present results indicating that FHBC+ women have lower perceived heart disease risk, underscore the importance of examining both particularly high and low perceptions of risk for various diseases, and the potentially disparate educational approaches necessary to correct such errors of estimation. Although intervention studies are necessary, our results point to the possible utility of informing women of their risks for other diseases (e.g., heart disease, colon cancer) in conjunction with counseling about breast cancer risk. In addition, the present data suggest that all women may benefit from educational efforts aimed at disseminating accurate lifetime risk estimates for breast cancer. Understanding risks for other diseases may be especially important to women at risk for breast cancer in light of recent reports [*21,22*] indicating that women who develop breast cancer are no less likely to develop heart disease than others. Moreover, Satariano [*34*] found that women who develop breast cancer actually have poorer breast cancer prognoses when diagnosed with comorbid heart disease. These findings underscore the importance of appreciating risk for heart disease even in the face of the threat of developing breast cancer.

It should be emphasized that this initial cross-sectional study cannot address several important issues. A longitudinal study is required to determine whether perceptions of disease risk change over the course of exposure to cancer- or other disease-related events throughout the life spans of women with family histories of breast cancer. Indeed, perceptions of risk may change as a function of situational factors, such as undergoing hypertension screening or mammography, or having a parent die from a disease. Prior research has already suggested that these events tend to generate disease-related worries that may be predictive of elevated risk perceptions [*35*], but prospective research is scarce.

Additionally, the present study examined women recruited from medical centers into a research study about breast cancer. Respondents might in some way be more sensitized to risk for familial breast cancer, and might not be representative of the general population. This possible selection bias could conceivably explain why the FHHD+ women in the present sample did not have lower breast cancer risk perceptions than FHHD− women. Nevertheless, findings of this initial study indicated that even in this group of possibly more "medically aware" women, perceptions of heart disease risk were lower among women with family histories of breast cancer. Furthermore, FHHD+ women had higher perceptions of heart disease risk even though the study was not advertised to address heart disease, suggesting that the present findings are not solely attributable to the operation of a recruitment bias. In addition, women overestimated their lifetime risks of colon cancer (17–30%, see Table 1, versus 5.6% actual risk [*1*]), even though they were not being recruited to a colon cancer study. Future randomly recruited community-based studies would be helpful to allow for generalization to other women. In addition, an analogous study specifically recruiting women with and without family histories of heart disease or colon cancer would help further characterize the operation of potential recruitment biases in the investigation of risk perceptions. This may be particularly important in light of the fact that many of the studies to date have relied on samples recruited for breast cancer research, which may result in samples of women with particularly high breast cancer risk perceptions.

Finally, little is known about the impact of inappropriate perceptions of heart disease risk on health behaviors. As mentioned above, a number of studies have found that breast and colon cancer risk perceptions were related to frequency of screening behavior. We are not aware, however, of any studies that have gone beyond speculation [*20*] to demonstrate that perceptions of heart disease risk are predictive of important behavioral endpoints such as diet, exercise, or screening for hypertension. As research continues to examine relations between perceived risk, health behaviors, and disease endpoints, intervention studies should focus on developing methods of effectively communicating risk information about multiple diseases to at-risk populations.

In sum, the present study contributes to an emerging appreciation that well-intended efforts to promote awareness of breast cancer risk in the population by both the health care community and the mass media may have had an adverse impact on perceptions of risk for heart disease, a much more likely source of morbidity and mortality. Legato et al. [*13*] have already reported elevated perceptions of breast cancer risk in the general population relative to perceptions of heart disease risk. Our results now indicate that this may be a particular problem among women with family histories of breast cancer.

ACKNOWLEDGMENTS

We acknowledge the helpful comments of Dr. Gary Winkel and the anonymous reviewers.

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